SEMI-ANNUAL PROGRESS REPORT NO. 10

May 1, 1979 - October 31, 1979

NASA Grant NGL 25-001-054

Submitted To

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Office of Space and Terrestrial Application
Technology Transfer Division
Washington, D. C.

Submitted By

W. Frank Miller*
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November 1, 1979

*Program Coordinator

SEMI-ANNUAL PROGRESS REPORT NO. 12

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APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS

I. INTRODUCTION

The major purpose of the Remote Sensing Applications Program is to interact with units of local, State, and federal government and to utilize Landsat data to develop methodology and provide data which will be used in a fashion such that a concrete, specific action will be taken by the cooperating agency. The attainment of this goal is dependent upon identification of agency problems which are immediate in nature, and subject to at least partial solution through the use of remotely sensed data.

Other subsidiary objectives include the development of a trained staff from the faculty of Mississippi State University who are capable of attacking the varied problems presented by the respective State agencies; the training of students in various University academic courses at both the undergraduate and graduate levels; the dissemination of information and knowledge through workshops, seminars, and short courses; and the development of a center of expertise and an operational laboratory for training and assistance to cooperating agencies.

II. GENERAL PROGRAM PROGRESS

The overall progress of the MSU Applications Program, if measured by the number of requests for services, has accelerated appreciably during the past six months. The Mississippi Heritgage Program has entered into a cooperative agreement to provide $16,000 for a two-phase study to identify areas within the lignite belt of Mississippi which have a high potential as unique or historical ecological habitats (Section III.F.). Habitats verified by ground examination would then be recommended for exclusion from any future surface mining activity. The Mississippi Mineral Resources Institute (MMRI) has provided the Program with $9,000 for a cooperative project to develop a technique for change discrimination in gravel operations (Section III.G.). The Mississippi Bureau of Geology and Energy Resources is encountering difficulty in defining the amount of surface-disturbed land in many of the gravel operations on the date the Mississippi Surface Mining and Reclamation Act was enacted, April 15, 1978; Landsat provides the only Statewide, historical data necessary to make this assessment.

Several real-time models were provided to the Civil Defense Director during Hurricane Bob in July. These models were later used for emergency response planning during Hurricane Frederick in September. A relocation of emergency equipment due partially to the flood potential illustrated by several CALUP models was made. Another user of the Lowndes County software system has been identified; Mr. Jerry Griffin, District Conservationist for the Soil

Conservation Service, has cooperated with the Program staff to develop models which illustrate landscape units (soil and terrain) which are likely to require land drainage systems, and high and low density residential areas which are in close proximity to potential flash flood zones.

As indicated in the last Semi-Annual Report, work on the Strip Mine project has been reduced pending processing of new data. A tentative meeting with the Alabama State Geologist and his staff has been scheduled for mid-November, 1979 (Section III.B.).

The Harrison County Board of Supervisors took action on one of the recommendations in the final report of the Beach Erosion project. Berms were constructed 25 ft to 50 ft seaward of the seawall in order to create wind turbulence and deposition of the sand before it reached the seawall in those areas identified as actively eroding beach (Section III.C.).

The State-wide Deer Habitat project has progressed in several major areas; 85% of the ground truth has been completed, processing of winter CCT data has been initiated, and planning for the data base has been completed (Section III.D.).

Progress in remote sensing data analysis systems was made in several areas: 1) conversion of existing software to reflect changes in processing on the new University computer (Univac 1100/80), 2) development of a program to process MSS data in new EROS format, 3) further development of programs to allow examination and

manipulation of Landsat images on the minicomputer system, and 4) development of an interactive modeling capability to produce interactions and/or unions of data base variables and/or subsets of data base variables.

No progress has been made in attempts to institutionalize the remote sensing efforts at the State level. The lack of progress is due primarily to the forthcoming general elections.

III. PROJECT PROGRESS REPORTS

A. Remote Sensing Applications in Land Use Planning - Lowndes County

Objective

To develop a Landsat-based data management system that will provide variables and data which can be used by the County Tax Assessor, the Civil Defense Director, and the Lowndes County Board of Supervisors, and for employment in the land use planning function by the Golden Triangle Planning and Development District and the Mississippi Research and Development Center.

Accomplishments

The accomplishments for this reporting period can probably best be expressed by excerpting portions of a letter from the Civil Defense Director of Lowndes County to the Program Coordinator. The complete text is included in Appendix I.

> "Certainly one of the most exciting accomplishments in recent months resulted from our experiments with real time use of the data base. The experiment began July 5 when the Civil Defense Office decided to establish approximately one dozen flood monitoring sites in Lowndes County in anticipation of the arrival of Hurricane Bob. After a morning meeting with our flood watch staff, your research associate, Mr. Dale Quattrochi, assisted me in the preparation of suitability models showing probable flood impact areas. Despite driving rains, before nightfall, the output was ready for use here in the office. Interestingly enough, the models confirmed our staff's intuitive selection of twelve sites. Beyond that, it gave us the opportunity to operationalize our immediate monitoring requirements on a real time basis. By using the same procedures developed in the Bob model we

can manipulate data base characteristics to anticipate areas where flood problems are most likely to occur. Unfortunately, the rainfall which we anticipated did not take place. However, several months later, in early September, Hurricane Frederick passed almost immediately over Lowndes County, creating flood problems which correspond very closely to the areas shown on the Bob printout. The information was used to coordinate traffic problems and to warn local residents regarding probable flood hazard areas.

I have also visited your office with members of the Mississippi Civil Defense Council for the purpose of acquainting them with CALUP potential for hazard mitigation planning. While no definite action has been taken in this area, the Mississippi Civil Defense Council is attempting to enlist federal support for a pilot project in this area. Along the same lines, Mr. Jack Bryan, Regional FEMA computer analyst, is incorporating CALUP in his proposal to the Plans and Operations FEMA directorate for a regional computerized resource inventory system. Furthermore, I have personally discussed the hazard mitigation aspects of CALUP with Ms. Gloria Jimenez, National Director of the Federal Insurance Administration. The reorganization presently taking place within the Federal Emergency Management Agency has delayed federal response to our proposals.

Several weeks ago, I visited your office with staff members of the National Weather Service in Jackson and the Hydrologist-in-Charge (HIC) of the Southeast River Forecast Center (SRFC) in Atlanta. These hydrologists were impressed with the capability of the system to show where water will go at various heights. Mr. Ed Fox who is the HIC at the SRFC in Atlanta, agreed, following a presentation of interactivities model on the minicomputer, to enclude Ellis Creek and Vernon Branch Creek in the flash flood self-help models being developed for Lowndes County. The Fe eral Insurance Administration is currently obtaining the necessary hydrologic data. The NWS will furnish all gages and equipment (Figures 1 and 2).

The use of CALUP models is not always confined to less tangible planning activities. Emergency equipment stored at the District 2 barn has been relocated

Figure 1. Vernon Branch Creek; this stream was added to the flash flood self-help models for Lowndes County as a result of models generated from the Lowndes County data base.

Figure 2. Residential flood impact zone immediately adjacent to Vernon Branch Creek.

> partially because of the flood potential as indicated in several of the CALUP models. A small levee is also being constructed at the Northeast corner of the Northwest Lowndes Fire Station after a similar determination. While I can't say these actions are 100% the result of the models, it is no doubt that their validation on paper can help validate "real life" problems, like in the situations just mentioned." (Figures 3 - 12).

In addition to the accomplishments indicated by the Civil Defense Director, models were developed for the Lowndes County Soil Conservation District to identify four problem areas flooding, soils requiring drainage, urban expansion, and soil erosion on sloping cropland. This information was used in preparing long range objectives in accordance with the Resources Conservation Act of 1977, and it was estimated that with the use of the Landsat-Based Information System, a savings of approximately 400 manhours and $4000 was accomplished (Appendix II) (Figures 13 - 17).

Current Status

Several small areas of the County have been selected for more detailed data base development. Although the number of variables being input is smaller, detail is greater, and the objective is to supply information to model existing flood events.

Plans

Program personnel will continue to encourage applications of the data base by a variety of government agencies.

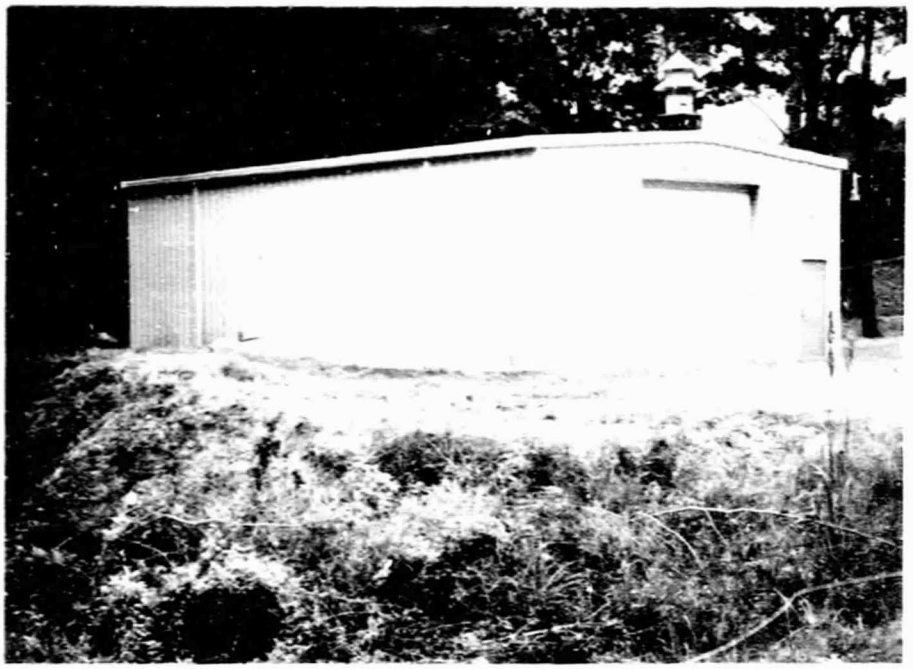

Figure 3. Fire station in the N.E. portion of Northwest Lowndes County. The levee being constructed to protect against flood damage is on the left side of the photograph.

Figure 4. Church subject to flash flooding from the third order stream located to the right.

Figure 5. Commercial and agricultural land subject to flash flooding from a third order stream.

Figure 6. Single-family home subject to flooding from Magby Creek. The creek flows directly behind the house. Note high-water mark (discoloration of bricks) along bottom of house.

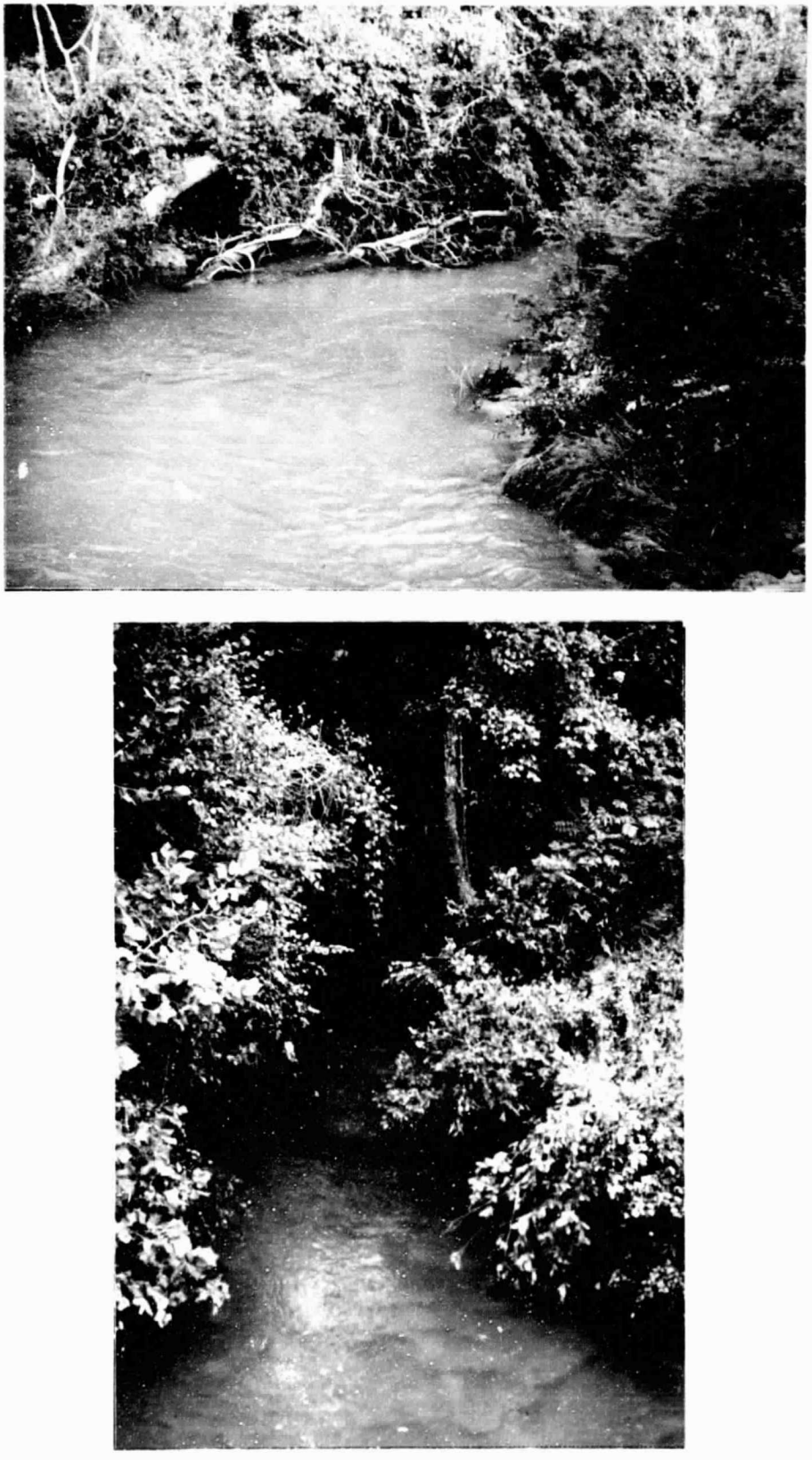

Figure 7. (Top and Bottom) Magby Creek - A flood-prone stream in Lowndes County.

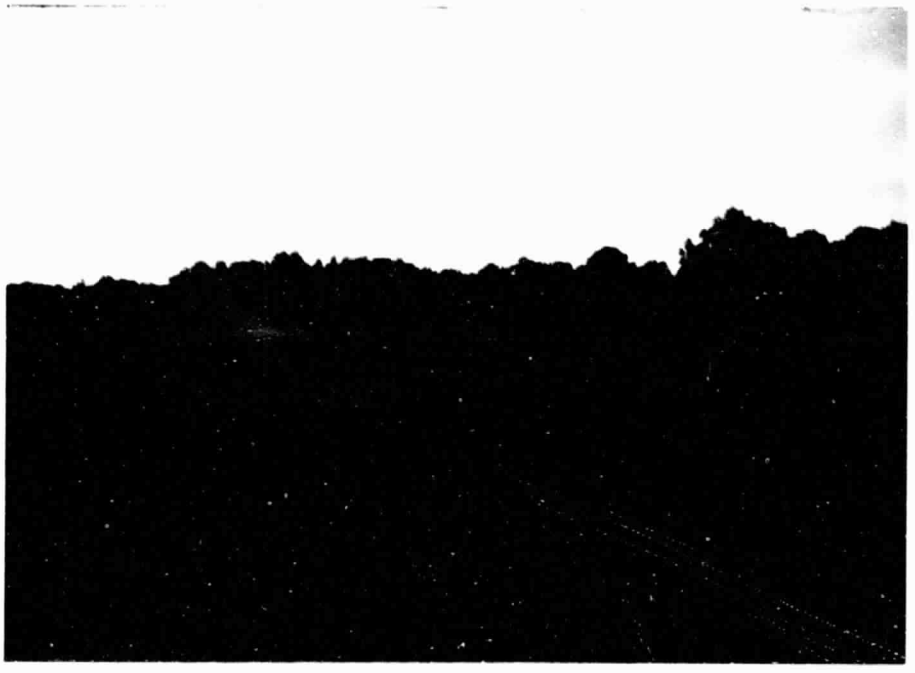

Figure 8. Agricultural area subject to flooding from Magby Creek. The creek lies in the row of trees behind the field.

Figure 9. Illustration of the impact of flooding on public facilities by a third order stream. Erosion of a secondary road in Lowndes County.

Figure 10. Luxapalila Creek - a flood-prone stream in Lowndes County.

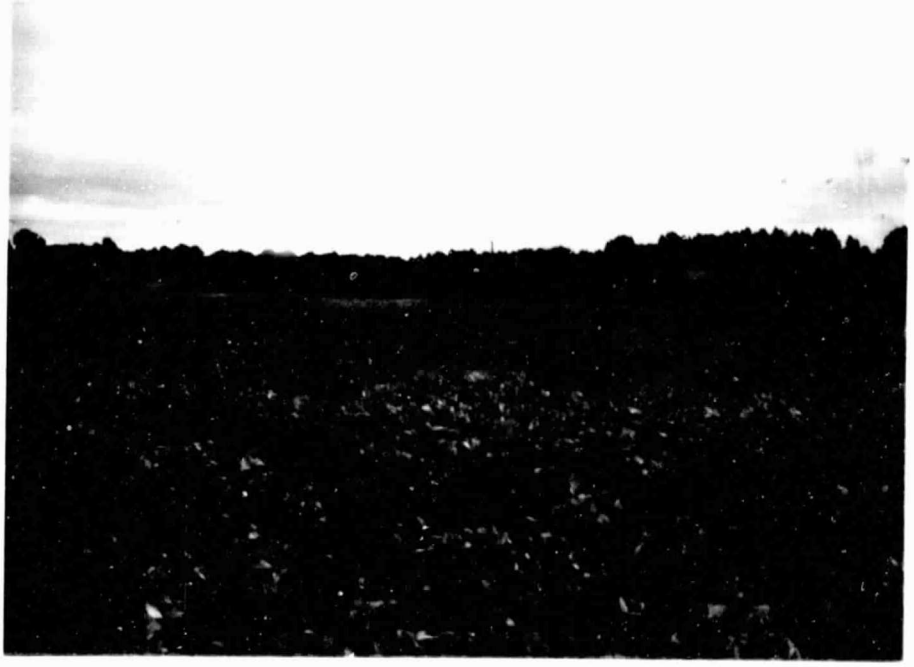

Figure 11. Agricultural area that lies within the flood limits of Luxapalila Creek; east-central Lowndes County.

Figure 12. Yellow Creek - another stream highly prone to flash flooding in Lowndes County.

Figure 13. (Top and Bottom) Before-and-after photographs illustrating a flood-prone residential area in Lowndes County. Flood resulted from heavy rains which fell over the County in April 1979.

Figure 14. Road damage in Lowndes County resulting fr heavy rains of April 1979. Top - U. S. H wy 82 in western Lowndes County. Bottom - impac on secondary road.

Figure 15. Flooding of residential area in Columbus, Mississippi, April 1979.

Figure 16. (Top and Bottom) Impact of flooding from Luxapalila Creek on public recreational facility, April 1979 - Propst Park located in Columbus.

Figure 17. Propst Park in Columbus - flooded by Luxapalila Creek, April 1979.

B. Applications of Landsat Data to Strip Mine Inventory and Reclamation

Objective

The objective of this project is to provide the Alabama Surface Mining Reclamation Commission and the Geological Survey of Alabama with the software and interpretative techniques for monitoring strip mine occurrence and reclamation activities. The results will also be provided to the Mississippi Geological, Economic, and Topographic Survey - the State agency which is responsible for administering the surface mining law in Mississippi.

Accomplishments

Progress on this project has been impeded by data acquisition and interpretation problems. Initially, a test of the tree classifier's temporal extension capabilities had been planned for this reporting period. The test was not completed, however, for two reasons: 1) acquisition of a cloud-free image taken during the leaf-off season for comparison with the February 23, 1976, data used previously was extraordinarily slow; and 2) numerous problems were encountered in attempts to obtain band-ratioed information from the new CCT of the study area that was finally acquired from EROS.

The delay encountered in procuring a suitable CCT for comparison with the digital data originally used in the study precluded any attempt at testing the decision tree classifier until mid-way through the reporting period. It was determined prior to a

request for a Landsat search of the Alabama study area that the most appropriate CCT would have an image date at least two years after the February 23, 1976, date. Significant changes in the extent of mining and reclamation activity occurred within the study site during the two-year period immediately following the date of the original CCT information. Several mines were partially reclaimed while others were expanded; a number of new surface mines also began operating during the period from 1976 to 1978.

All of the Landsat searches of the area for 1978 revealed an absence of suitable image dates during the leaf-off season. Those dates that were available unfortunately did not have data that were of acceptable image quality for use in the study. Consequently, only data taken in the early winter of 1978-79 or prior to infloration in the spring of 1979 were available. Two image dates, March 6 and March 15, 1979, were selected as candidates for use in our temporal extension tests; the earlier date, however, was preferred to the latter because of its better leaf-off qualities. A request was made to EROS for acquisition of the March 6, 1979, CCT.

Upon receipt of the tape and subsequent interpretation of the Landsat digital information, it was discovered that the data were abnormal in appearance. Numerous attempts at correcting the problem proved fruitless. As a result, the CCT was returned to EROS and the March 15, 1979, date was shipped in return.

Future Plans

The data on the March 15 CCT was in good order, but it was discovered that because of format changes on Landsat CCTs processed after February 1979, the band ratio generator would not work on the new tape. After resolving this difficulty, it now appears that the final phase of the project is ready to commence. Within the next six months, the temporal extension capabilities of the decision tree classifier will be tested, using the March 15, 1979, data for comparison with the February 23, 1976, digital information. When analysis of the results have been completed, a meeting will be held with members of the Alabama Surface Mining Reclamation Commission and the Geological Survey of Alabama. Contingent upon their approval, the decision tree classifier software will be transferred to these agencies for use in monitoring surface mine reclamation activity within the State.

C. Beach Erosion Control - Pass Christian

Objectives

The overall project objective is to apply remote sensing technology to the delineation of zones of high erosion along the Pass Christian Beach.

Specific objectives are:

1) To refine and adapt remote sensing techniques to identify and define those beach areas along the Mississippi Gulf Coast at Pass Christian, Mississippi, which are sources of wind-blown sand.

2) To develop automated procedures calibrated with ground truth information and meteorological data for estimating zones of sand movement origin.

3) To design sand stabilization or turbulence obstruction features which, when appropriately located on the beach, will reduce sand erosion, are aesthetically pleasing, and are consistent with tourist attraction and use and local commercial activities.

Accomplishments

All of the objectives listed above have been met, and a final report has been completed. Three copies of this final report are being forwarded as a separate item with this Semi-Annual Report. The Harrison County Board of Supervisors followed through on one of the recommendations to stabilize actively eroding beach areas, and caused berms to be constructed about 25 ft to 50 ft seaward of the existing seawall between the beach and U. S. Highway 90.

These berms were established to disrupt the laminar flow of wind and sand, and thus cause deposition of the sand before it reaches the seawall.

Current Status

This project will be inactive until the actions taken below are completed. The project will then be terminated.

Future Plans

Copies of the final report have been submitted to the Harrison County Board of Supervisors, the Mississippi Marine Resource Council, and the Commissioner of the Southern Highway District. Individual presentations will be made to these groups in December in an effort to gain acceptance and implementation of the study recommendations.

D. White-Tailed Deer Habitat Evaluation Using Landsat Data

Objectives

In order to provide a basis for sound natural resource management in Mississippi, the Mississippi Game and Fish Commission has initiated the development of a State-wide data base system which will be used to describe various components of Mississippi's ecosystems. The high priority of the white tailed deer (Odocoelius virginiana) in the Commission's management policies dictates that various types of deer "habitat" be mapped and evaluated on a State-wide basis. These "habitats" will be delineated on the basis of several bio-physical variables.

Because of its synoptic and temporal characteristics, Landsat multi-spectral scanner (MSS) data will be used as the basis for vegetative evaluation. Both supervised and unsupervised classification of the data will be performed to determine the most accurate and the most cost-effective means of mapping vegetation. Other variables used to evaluate deer habitat will be compiled from existing sources.

All data will be configured in a computer-assisted data base to facilitate rapid and accurate habitat evaluation.

The project's objectives, in order of planned completion, are:

1. To determine those types of vegetative associations which are of significance in managing Mississippi's white-tailed deer.
2. To determine which of several analytical procedures are most effective in detecting these vegetation types using Landsat MSS data.

3. To configure this vegetation data, as well as other data pertinent for habitat evaluation, in a computer-assisted data base which will permit habitat description and evaluation.

Accomplishments

Observations of field sites have been the major concern of the project during the past 6 months. Representative stands of major forest vegetation associations present on each of four study areas were examined to determine stand composition, structure (physiognomy), density, topography, and soil conditions. These observations will be used for the verification of forest-type maps derived from Landsat data. Ground observations will also be used to describe the various deer habitats within each study site.

Sixteen timber stands at the Leaf River Game Management Area (GMA), eighteen at the Tallahala GMA and sixteen at the Choctaw GMA have been examined. Stands at the Noxubee National Wildlife Refuge are presently being examined. These stands represent approximately five forest types at each study area; replicate stands are included to determine variability in the various forest cover types. In each stand, between six and eight stations have been visited.

Digital satellite data have been obtained for all study areas for Fall 1978 and for Winter 1978/79. Spring and Summer 1978 data

will be obtained shortly. Once acquired, the data will permit examination of land cover within each study site across a broad range of phenologic conditions.

Supervised analysis of two study areas has been initiated using the November 1978 MSS data. The ground data collected this past summer from the two areas are being used to select training areas. The EOD-LARSYS software package on the MSU UNIVAC 1100/80 computer is being used for this analysis.

Software planning for configuration of the deer habitat information into the data base has been completed. The software developed for the Lowndes County Project will be used to store the deer habitat data with only minor modifications to improve data loading efficiency. Discussions with representatives of the MSU Department of Wildlife and Fisheries and the Mississippi Game and Fish Commission have resulted in a list of variables which will appear in the data base. These variables and their sources are shown in Table 1.

Present Efforts

During the past six months, project efforts have primarily been concerned with the delineation of vegetative cover using digital Landsat data; supervised and unsupervised clustering algorithms from the EOD-LARSYS software package have been employed. Acquisition of CCTs for all sites during a spring and summer period is in progress. The tapes available for these seasons from

Table 1. Variables for Inclusion in the White-Tailed Deer Habitat Evaluation Data Bases.

Variable	Source
Political Boundaries (County, Township, Range, Section Lines)	USGS Topo Maps, Local Records
Transportation Network	USGS Topo Maps, Air Photos, Municipal Records
Utility Right-of-Ways	Air Photos, USGS Topo Maps
Physiography	Existing In-House Studies
Land Capability Class	Soil Conservation Service Soils Surveys, Field Observations
Land Form	Air Photos
Elevation/Slope	National Cartographic Information Center Digital Tapes
Surface Water (Streams, Lakes, Etc.)	USGS Topo Maps
Soils Associations	Soil Conservation Service Maps, Field Observations
Land Cover	Landsat MSS Tapes

1979 are of unacceptable quality and, therefore, 1978 data will be used.

In preparation for their digitization into the data base, the other variables used in the deer habitat analysis are being reformatted onto common base maps for each study area.

Future Plans

Present efforts of MSS data analysis will be expanded to include all four study areas during four seasons. This analysis will continue into April 1980 and will result in final vegetation maps for all study areas. A digital version of each map will then be loaded into the data base according to the appropriate study area.

One of the study areas will be selected to demonstrate the data base construction process. The reformatting, digitizing, and loading of the variables for that study area will take precedence over those operations for the other three areas. This demonstration data base should be complete in March of 1980. Construction of the other three data bases will occur concurrently with the first data base, but the work on these areas will proceed at a reduced pace. Regardless of any data base efforts, mapping of vegetation within each study area using Landsat MSS data will be the most important task.

Early in February or March 1980, discussions will begin to plan the actual habitat evaluations using the data bases. Initially,

work will be done to compare a ground-based habitat evaluation with that of the automated data bases. It is also anticipated that the resultant computer-assisted evaluations will be correlated with deer herd data, such as density and distribution, that is available from the Mississippi Game and Fish Commission and Mississippi State University.

E. Remote Sensing Data Analysis Support Systems

Objectives

To effectively implement the remote sensing applications and projects of the Applications Program, particularly those involving the Landsat multispectral data, it is essential that reasonably sophisticated computer-based data processing and data analysis systems be developed. Considerable effort is required to develop new computer software, to adapt existing software, and to install needed hardware facilities. This is in addition to the operational data processing and data analysis needs of each demonstration project. Moreover, it is the objective of the Data Analysis Support Systems to provide the data collection and processing capabilities necessary to support the various demonstration projects, and to provide a low-cost operational center so that such projects can have a continuing input into the overall objective of the Applications Program.

Accomplishments and Current Status

As in the last two reporting periods, the majority of the data analysis support has been dedicated to the development and improvement of software system for the graphics/image processing minicomputer system. The minicomputer system (described in several previous project reports) is completely installed and a core of supporting applications software is now operational.

Central to the development of minicomputer software is a generalized image processing system for examination and manipulation of images (primarily Landsat images). The design goal is to provide a single software system with a wide variety of general functions allowing users with different interests and applications to utilize image manipulation and display capabilities without a costly special purpose program being developed in each case. Input is an English-language style format for users with little experience. The functions (or image manipulation routines) provide for algebraic operations (addition, multiplication, subtraction, and division) and logical operations (and, or, relations) on the image data. Also, the user is provided several examination operations such as windowing, zooming, color modification, etc. Currently, the image manipulation software system is operational, but needs refinement.

The major application software operational on the minicomputer system is a much-revised version of CALUP (Computer Assisted Land Use Planning) with associated data base management software. In addition to the CALUP modeling output (described in previous project reports), the software package can now interactively display intersections or unions of data base variables, or subsets of data base variables. Recently added functions include the capability to reference data base variables by achronyms rather than by numbers, the production of a four-neighbor proximity

image from any display, and the saving of any display for later processing. Also, capabilities for interactively adding, deleting, replacing, smoothing, and creating variables from digitized data have been partially implemented and are expected to be fully implemented by the end of November.

In order to enhance the overall capabilities of the minicomputer system, conversion of several existing software packages to the minicomputer would be useful. Two such packages, HINDU and DAM, are currently being developed. HINDU, an unsupervised multispectral classification program, is operational with the University's main computer and has been used in several projects. DAM (detection and mapping), a one class supervised classifier, has not been used at Mississippi State, but has been successfully used for water mapping at Johnson Space Center. Significant difficulty, due to program size and system incompatabilities, has been encountered in the conversion attempt and neither system is now operational with the minicomputer. Other software developments during the last six months include a generalized program to convert MSS data with the new format to LARSYS format, and revisions in existing software to accommodate a number of system changes when the University installed a new main computing system in May.

In October, two research assistants assigned to data analysis support each presented a paper at the ACM Mid-Southeast Fall Meeting in Gatlinburg, Tennessee. The presentations, "Production of False

Color Images" by Rena Haynes and "Logical Operations for Image Analysis" by David Scott were preceded by a short overview of the entire project. Attendees included faculty of several universities in Mississippi, Tennessee, Alabama, and Georgia, a significant representation from Tennessee installations of Union Carbide and TVA, as well as others.

Plans

Future plans are twofold: (1) to continue providing software development and data analysis support to the individual projects of the Applications Program; and (2) to enhance and continue to develop generalized systems for display, classification, manipulation, and storage of geographically-oriented image data. Specifically, this includes enhancement of the generalized image processing software for the minicomputer system, conversion of the HIDU and IBM packages to the minicomputer system, improving procedures for data entry (digitizing) of image data, and providing adequate user documentation.

F. Discrimination of Unique Forest Habitats in Potential Lignite Areas of Mississippi

Introduction

As a result of the critical energy crisis which the United States faces, lignite deposits in Mississippi have become increasingly important as a potential source of recoverable fossil fuels. There is a "belt" of lignite deposits in northern and east-central Mississippi that has a high propensity for easy extraction by current surface mining methodologies. The lignite belt is broken into two sections; one section extends from north of Marks, Mississippi, in Quitman County, through western Panola County into Lafayette County. The other belt begins in Lauderdale County and continues through Kemper, Neshoba, Winston, and Choctaw Counties into Webster County.

The surface extraction of lignite will inevitably have an impact on the physical environment where the mining activity occurs. It is imperative, therefore, that areas of unique or historical ecological habitats within the lignite belt be documented and preserved if possible. One type of forest community which needs to be delineated and mapped before it is destroyed by lignite surface mining activities is old growth hardwood stand remnants. Since Mississippi has few remaining older natural stands of hardwood species that have not been affected by clearing for agriculture, by fire, or by harvesting activities, it is essential that these areas be identified as soon as possible.

Objectives

It is the object of this proposal, therefore, to outline a methodology using cost-effective remote sensing techniques for identifying large, contiguous areas of old growth hardwoods that do not exhibit signs of recent disturbance within Mississippi's lignite belt.

Procedure

The proposed study will be implemented in two phases. Phase I will entail the identification of large contiguous forested areas in the lignite belt via 1:250,000 scale Landsat color composite imagery. Within the identified areas, a computer-assisted classification will be made with Landsat digital data to delineate areas which are dominantly of hardwood composition. These areas will be superimposed on a digitized base map containing data on physiography, soils, and geology. The superimposed information will provide an indication of where areas with a high probability for unique hardwood stand remnants exist. Areas with high potential would include stands occurring on north and east facing slopes of deeply dissected terrain, foreslopes of cuestas and locations with similar physiographic conditions.

Phase II will consist of an aircraft overflight of the areas selected for further study to limit the size of these sites and to establish exact forest community composition. Field survey activities will be conducted to verify the actual location of old growth

stand remnants and to confirm ecological habitat contents. The hardwood stands that have been identified will be classified along with the existing understory according to Society of American Foresters criteria, and on modifications necessary to adapt the scheme to the nuances of the local forest community. As a final product, the remnant hardwood stands that have been identified as important forest ecological habitats suitable for preservation will be delineated and mapped.

Accomplishments

Color composites of 1/250,000 scale and Band 7 prints for the entire lignite belt were received and manually interpreted. A mylar overlay delineating areas of deeply dissected terrain was prepared from the Band 7 enlargements. This overlay was placed on the color composites, and large, contiguous areas of predominantly hardwood composition within the previously delineated rough terrain units were mapped.

The CCTs for the two frames have not been received.

Future Plans

Upon receipt of the CCTs an ISOCLS will be performed, and an attempt will be made to develop a "roughness" index as a measure of stand texture. The theory is that the "rougher" the texture of the stand, the more likely it is to be of large-crowned, uneven-aged physiognomy. The areas discriminated within the suitable terrain units will then be flown with color infrared at a scale of 1/24,000 for final screening before ground surveys are initiated.

G. Landsat Change Discrimination in Gravel Operations

Introduction

In order to verify the areas of gravel operations which are subject to reclamation under the State's Surface Mining Act, i.e., lands mined after April 15, 1978, an historical data source which both predates and postdates the April date will be necessary. In addition to the temporal nature of the data, the data source should also provide for complete coverage of the major areas of activity. As identified by the MBGER* the major activity areas are the Tombigbee River from Tishomingo to Noxubee County, the Loessial Bluffs, and the Copiah County area.

The only data source which promotes temporal, synoptic coverage of the nature required for this project is the Landsat data collection system. It is proposed that Landsat digital data be utilized to effect a change detection of areas of active gravel operations between a date just prior to April 15, 1978, and a date during the spring or summer of 1979.

Objectives

The objectives of this proposal are to: (1) develop methodology and computer software to effect temporal change detection in extent of gravel operations, and (2) perform the change detection analysis on a portion of the Loessial Bluffs from a point east of Greenwood to the north.

*Mississippi Bureau of Geology and Energy Resources

Procedure

Two Landsat computer compatible tapes (CCTs) will be acquired covering the activity areas. The dates of these tapes will be as close as possible but prior to April 15, 1978, and also for the spring or early summer of 1979. Concurrently, locations of individual operations in the study area will be acquired from the MBGER, and will serve as screening to reduce the amount of computer time required. Individual activity areas will be extracted from each of the 2 CCTs and stored. Initially, only those areas will be used for development of a software package for change detection. The accuracy of a normal EOD-LARSYS ISOCLS analysis will be tested and compared with a tree-classifier algorithm which will be developed.

The products generated will be a computer map of each activity site condition pre-and post-April 15, 1978. The active acreage will be shown for pre-and post-April 15th dates for each site. The study area will be that portion of the Loessial Bluffs occurring on the CCT of Path 24, Row 36 from slightly north of Greenwood and extending to at least a line west from Oxford and possibly to the Mississippi-Tennessee line.

Accomplishments

Work has not yet been initiated on this study.

Future Plans

Upon acquisition of the appropriate Landsat CCTs, work will proceed as indicated in the Procedure.

IV. LIST OF SPECIAL ASSISTANCE OFFERED

Information Supplied or Publications Supplied

Weyerhaeuser Company, Centralia, WA

Gulf Research and Development Company, Lakewood, CO

Department of Botany, University of Tennessee, Knoxville, TN

Canadian Centre for Remote Sensing, Ottawa, Ontario

Piedmont Planning District Comm., Farmville, VA

Saasveld Forest Research Station, George, South Africa

Ashland Coal, Inc., Ashland, KY

Reagan and Smith, Engineers, Nashville, TN

PÉCS Designing Company, Péc, Hungary

Biological Sciences Department, Wichita State University, Wichita, Kansas

Southern Community State College, New Haven, Conn.

Division of Land Resources Mgt, CSIRO, Alice Springs, Australia

Department of Soils, Punjab Agricultural University, Ludhiana, India

Anderson-Clayton, Houston, TX

Department of Edaphology, Nucleo Univ. de Pedralbes, Barcelona, Spain

Demonstration and Educational Activities

Demonstrations of the interactive color graphics system or tours of the MSU Remote Sensing Laboratory were given to the following individuals or groups during this reporting period:

State Senator Dale Ford and party

Agricultural Bankers, Mid-South Region

Mississippi Research and Development Center Staff

Mr. Jim Maher, Operations Office, Mississippi Civil Defense Council

Staff Members, NOAA, Jackson, Mississippi

Mr. Ed Fox, Hydrologist-in-Charge, Southeastern River Forecast Center, Atlanta, Georgia

Facilities

In May 1979, the MSU Remote Sensing Applications Laboratory was moved from temporary quarters in the basement of Dorman Forestry and Plant Sciences Building into a permanent laboratory facility located across the street. Funds for the renovation of a faculty house now used as the remote sensing laboratory were provided by the MSU Office of Research and the Mississippi Agricultural and Forestry Experiment Station. This refurbished structure is approximately 1,460 square feet in size and houses a major portion of the Remote Sensing Applications Laboratory. The facilities used as a temporary lab located in the basement of Dorman Forestry and Plant Sciences Building were also renovated to provide for a photogrammetry/remote sensing teaching laboratory.

The present facilities include:

1. The Remote Sensing Applications Laboratory, 1,460 square feet (Forestry).

2. An academic teaching laboratory, 1,600 square feet, located in Dorman Hall (Forestry).

3. The geography unit of the Applications Laboratory, 490 square feet, located in Hilbun Hall (Geography).

4. The Graphics/Image Processing Laboratory, approximately 600 square feet, located in the Simrall Electrical Engineering Building.

APPENDIX I

COLUMBUS-LOWNDES COUNTY EMERGENCY OPERATING CENTER

OFFICE OF THE CIVIL DEFENSE DIRECTOR

LOWNDES COUNTY COURTHOUSE

COLUMBUS
The Mayor
City Council

Post Office Drawer 1408
Phone 601/328-8120
Columbus, Mississippi
39701

LOWNDES COUNTY
Board of Supervisors
The Chancery Clerk

October 18, 1979

Mr. Frank Miller
Department of Forestry
Mississippi State University
Drawer FD
State College, MS 39762

Dear Mr. Miller:

I would like to thank you and your staff for your increased level of assistance during the past several months. I would like to take this opportunity to recount briefly some of the activities which have been undertaken as a direct result of CALUP output.

Certainly, one of the most exciting accomplishments in recent months resulted from our experiments with real time use of the data base. The experiment, you may recall, begin July 5, when the Civil Defense Office decided to establish approximately one dozen flood monitoring sites in Lowndes County, in anticipation of the arrival of Hurricane Bob. After a morning meeting with our flood watch staff, your research associate, Mr. Dale Quattrochi, assisted me in the preparation of suitability models showing probable flood impact areas. Despite driving rains, before night fall the output was ready for use here in the office. Interestingly enough, the models confirmed our staffs intuitive selection of twelve sites. Beyond that, it gave us the opportunity to operationalize our immediate monitoring requirements on a real time basis. By using the same procedures developed in the Bob model we can manipulate data base characteristics to anticipate areas when flood problems are most likely to occur.

Unfortunately, the rainfall, which we anticipated, using a proximity to streams variable, did not take place. However, several months later in early September, Hurricane Frederick passed almost immediately over Lowndes County, creating flood problems which correspond very closely to the areas shown on your July 5 printout. The information was used to coordinate traffic problems and to warn local residents regarding probable flood hazard areas.

Another project which is currently under way, but not yet complete is our use of CALUP data for evidence cost benefit relationships and resulting from a flood control project currently under study along the Magby Creek in Columbus. The Army Corps of Engineers is conducting the study under Section 205 of the Flood Control Act of 1948. In the preliminary survey prior to the feasibility study, Corp personnel were favorably impressed by output for the Magby Creek area. They have agreed to incorporate this information in their final determination which is scheduled for completion in 1980.

In recent months I have visited your laboratory with several other interested parties and prospective users. One of them Mr. Jerry Griffin, from the Soil Conservation Service Work Unit, came to me for assistance in the preparation of materials for use in a public participation program designed to promote wise land use and to reduce potential for future disasters. He has been working on some of the same problems that I have and his approach to probable agricultural damaged areas and flood prone areas is both interesting and useful.

I have also visited your office with members of the Mississippi Civil Defense Council for the purpose of acquainting them with CALUP potential use for hazard mitigation planning. While no definite action has been taken in this area, the Mississippi Civil Defense Council, is attempting to enlist federal support for a pilot project in this area. Along the same lines, Mr. Jack Bryan, Regional FEMA computer analyst, is incorporating CALUP in his proposal to the Plans and Operations FEMA directorate, for a regional computerized resource inventory system. Furthermore, I have personally discussed the hazard mitigation aspects of CALUP with Ms. Gloria Jimenez, National Director of the Federal Insurance Administration. The reorganization presently taking place within the Federal Emergency Management Agency has delayed federal response to our proposals.

Several weeks ago, I visited your office with staff members of the National Weather Service in Jackson and the Hydrologist-in-Charge of the Southeast River Forecast Center in Atlanta. These hydrologists were impressed with the capability of the system to show where water will go at various heights. Mr. Ed Fox who is the HIC at the RFC in Atlanta, agreed following a presentation of inter-activities model on the mini-computer to enclude Ellis Creek and Vernon Branch Creek in the flash flood self-help models being developed for Lowndes County. The Federal Insurance Administration is currently obtaining the necessary hydrologic data. The NWS will furnish all gages and equipment.

The use of CALUP models is not always confined to less tangible planning activities. Emergency equipment stored at the District 2 barn has been relocated partically because of the flood potential as indicated in several of the CALUP models. A small levee is also being constructed at the Northeast corner of the Northwest Lowndes Fire Station after a similar determination. While I can't say these actions are 100% the result of the models, it is no doubt that their validation on paper can help validate "real life" problems, like in the situations I just memtioned.

Perhaps I should also bring to your attention, Mr. Quattrochi and myself, are obtaining data for a hazard mitigation planning model which will be presented to FEMA officials and others, next Spring. We are gathering information regarding air traffic, rail traffic, and forest fire potential to delimit particular hazard areas. It is hoped that this information will be used to select a location for a new Volunteer Fire Department station to be constructed in Lowndes County.

As you are well aware I have also used the system to determine for the first time the number of acres involved in the proposed county flood insurance program. We are currently utilizing CALUP data to provide local citizens with information regarding flood hazard factors in Lowndes County.

Again let me thank you for all of your help in these projects. Let me know if I can do anything to help you in your Lowndes County projects.

Sincerely,

Ray M. Gildea

Ray M. Gildea, Director

RMG:gch

APPENDIX II

United States Department of Agriculture
Soil Conservation Service
P. O. Box 989
Columbus, MS 39701
October 29, 1979

Dr. Frank Miller
Dept. of Forestry
P. O. Drawer FD
Miss. State, MS 39762

Dear Dr. Miller:

I would like to express my appreciation to you and Dale Quattrochi for the help you have given me.

As I stated when I approached you with our problem, we are assisting the Lowndes County Conservation District in preparing their long-range objectives in accordance with the Resource Conservation Act of 1977. Gathering information on the four problem areas they defined — flooding, drainage, urban expansion, and soil erosion on sloping cropland — would have been tedious work by any other means. By using the remote sensing technical data that you have compiled, approximately 400 man hours and 4000 dollars have been saved. At a time when our man power and budget obligations are low, this is really a significant savings.

Thank you for your assistance, and I look forward to working with you on other projects.

Sincerely,

Jerry W. Griffin
District Conservationist
Soil Conservation Service
Columbus, MS

Lowndes County Conservation District

1601 2ND AVENUE NORTH, P. O. BOX 989, COLUMBUS, MISSISSIPPI 39701

October 29, 1979

Dr. Frank Miller
Dept. of Forestry
P. O. Drawer FD
Miss. State, MS 39762

Dear Dr. Miller:

As Chairman of the Lowndes County Conservation District, I am grateful for the information you and Dale Quattrochi have provided us with in developing our long-range objectives.

Without your assistance in providing us technical data on our problem areas — flooding, drainage, urban expansion, and soil erosion on sloping cropland — we would have a difficult time in determining the location and extent of these areas.

Sincerely,

L. D. Gatlin

L. D. Gatlin
Chairman
Lowndes County Conservation District